Live time

A. Contin

June 2012

Goal

Check the livetime estimate in root file (pLevel1(0)->LiveTime), using the time difference between events (pLevel1(0)->TrigTime[4]).

Event sample: all B572/pass2 runs.

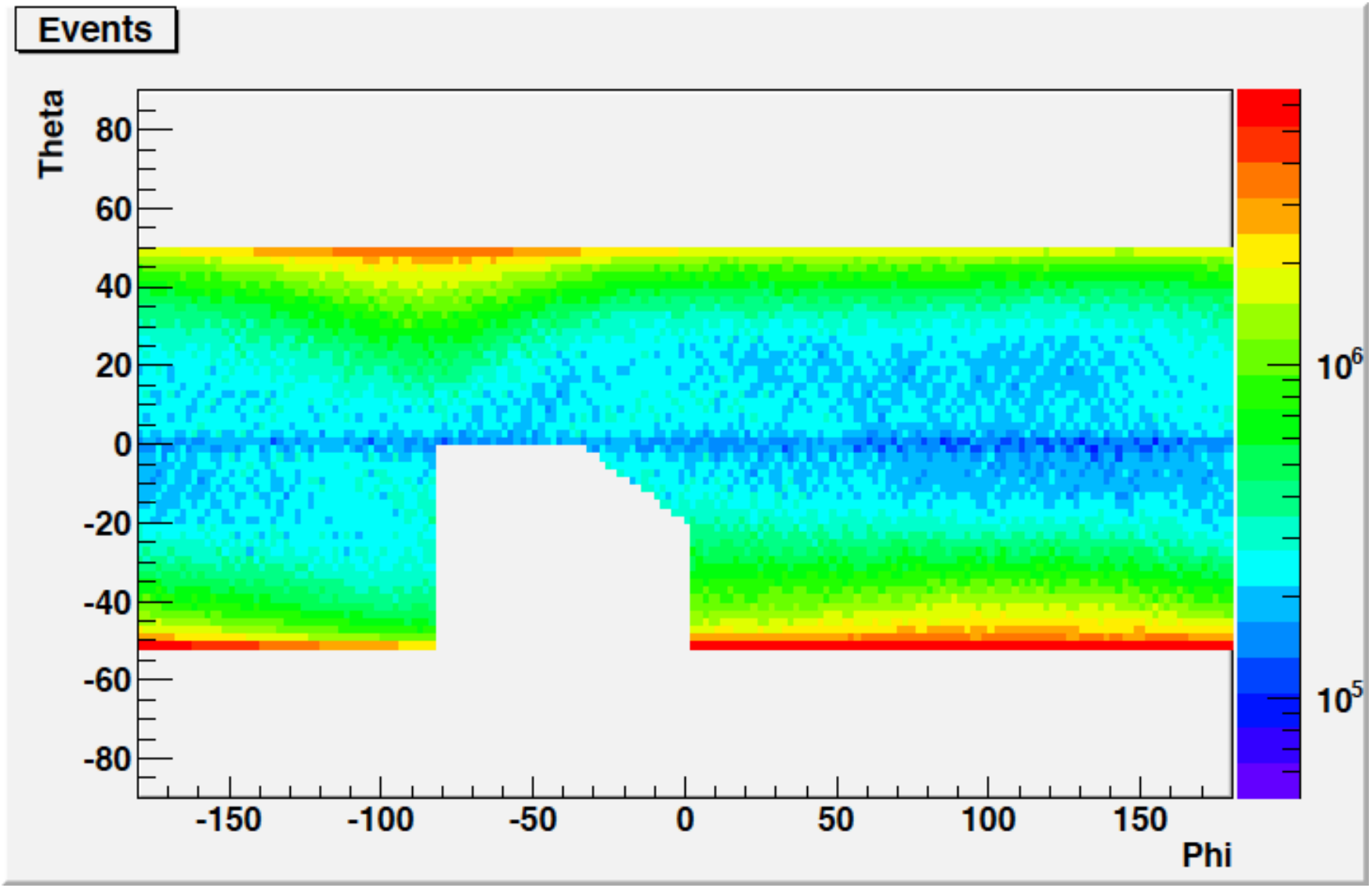
Principle of the measurement

Cumulate the time difference between each event and the previous one in bins of geographic theta and phi (2x2 degrees).

Fit the resulting plots with a negative exponential.

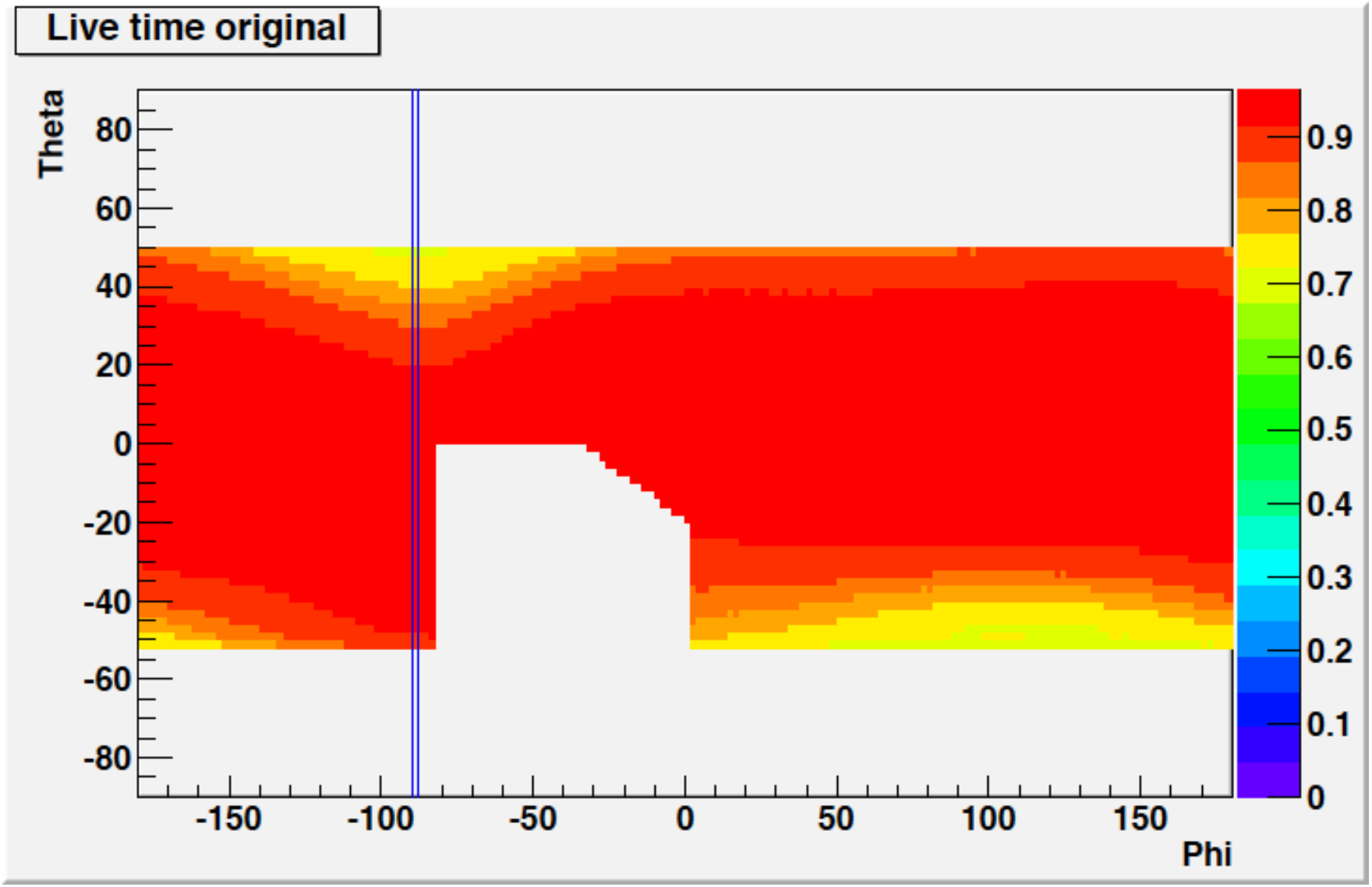
The real trigger rate is the inverse of the exponential coefficent.

Results – collected events



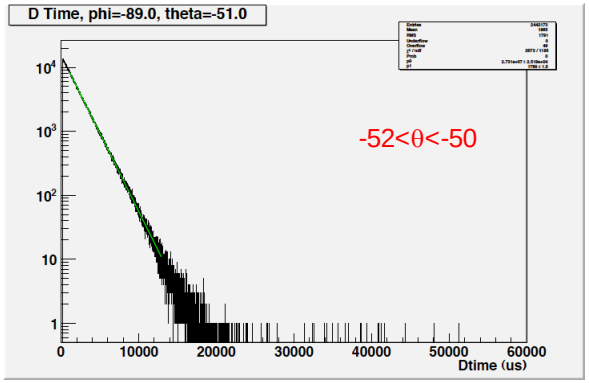
The statistics is very large in all bins.

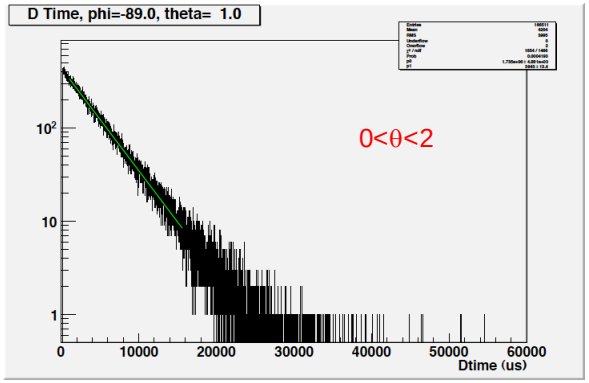
Results – root file livetime distribution

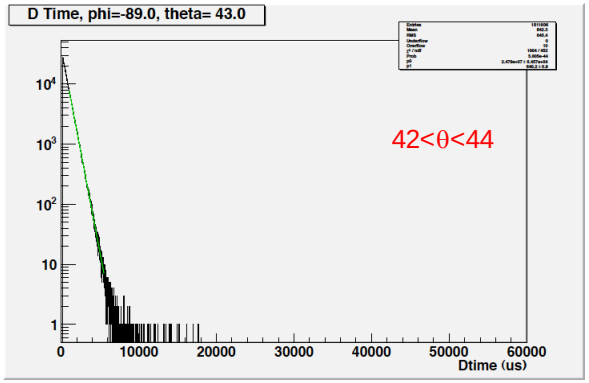


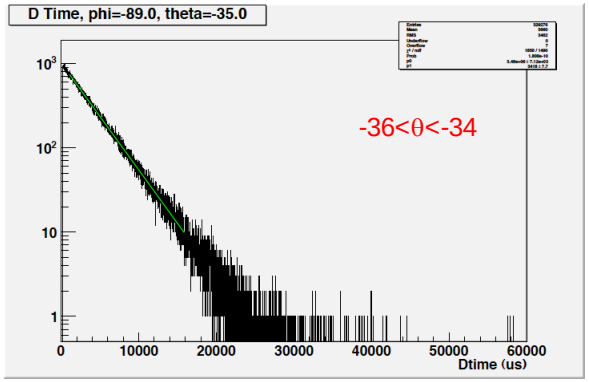
The blue line indicate the phi interval for the plots in the following slides.

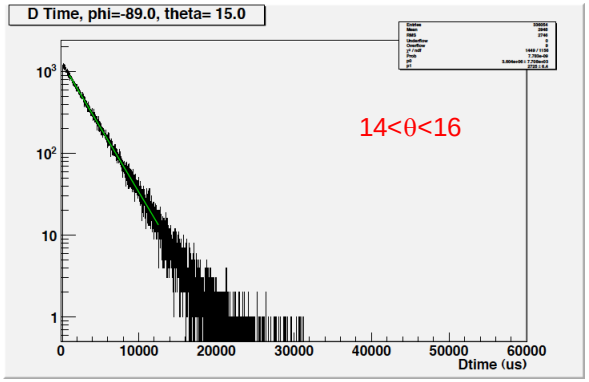
Results – sample fits

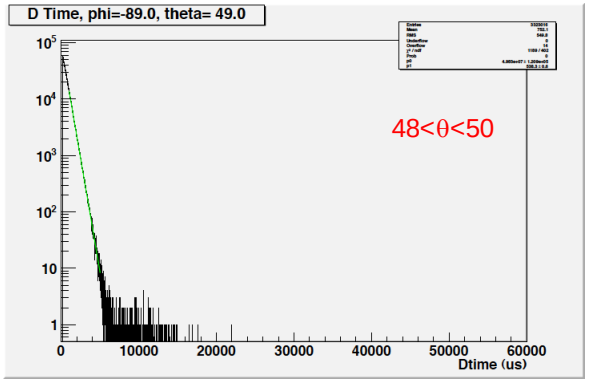


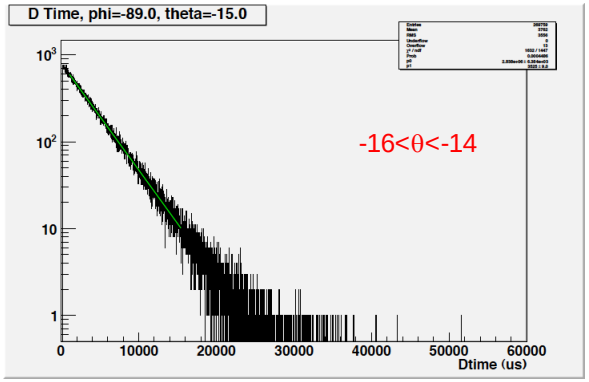


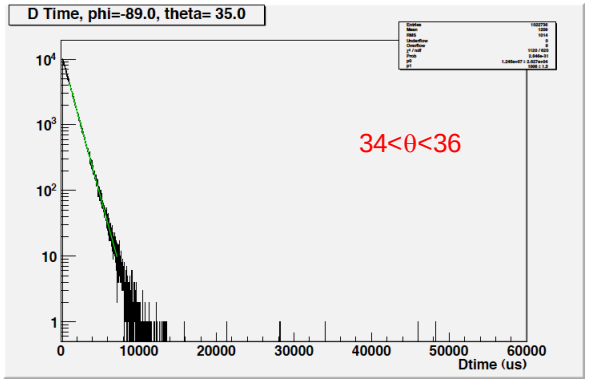






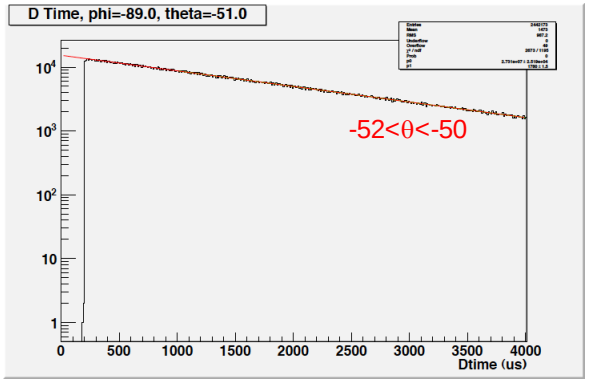


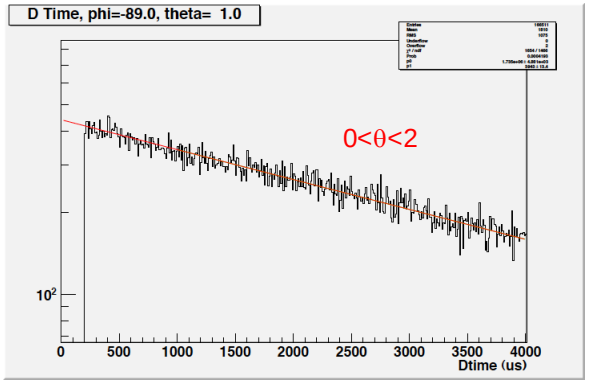


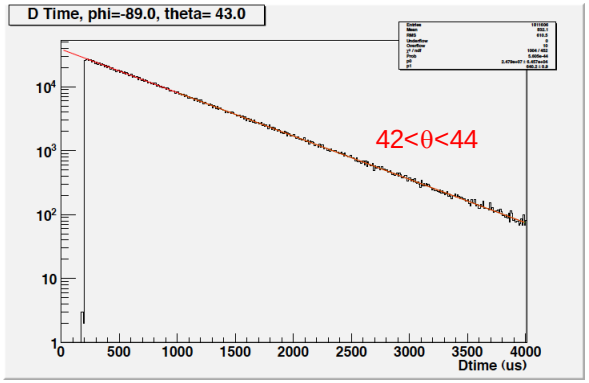


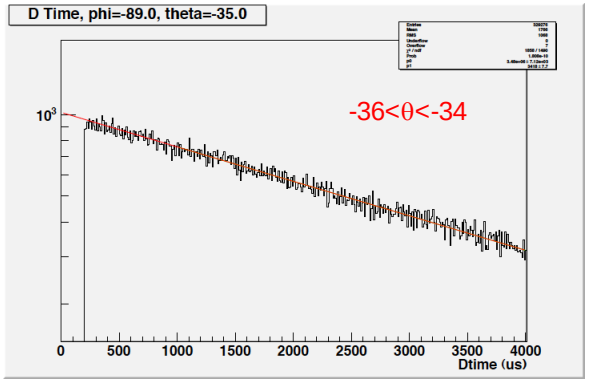
The fit is performed between 500 μs and the first bin with less than 10 entries.

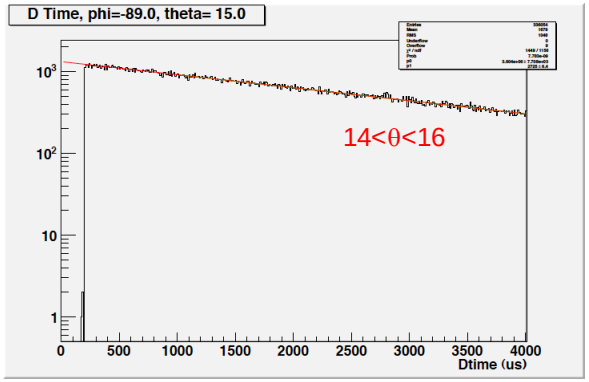
Results – sample fits, enlarged plots

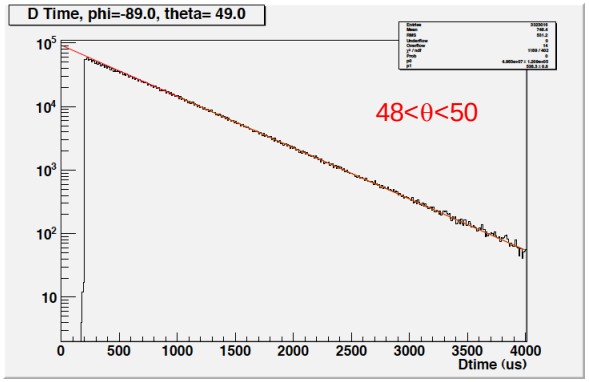


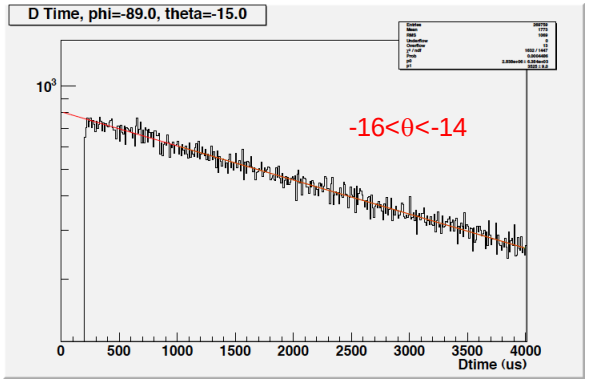


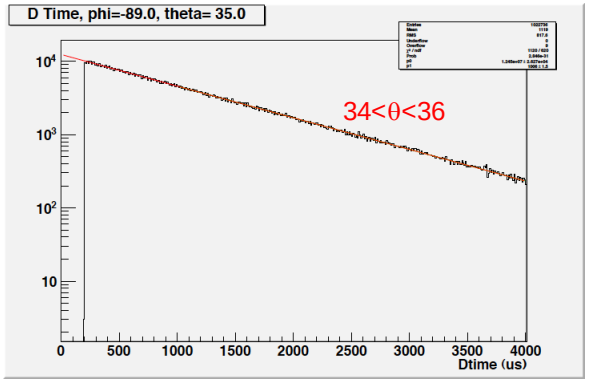






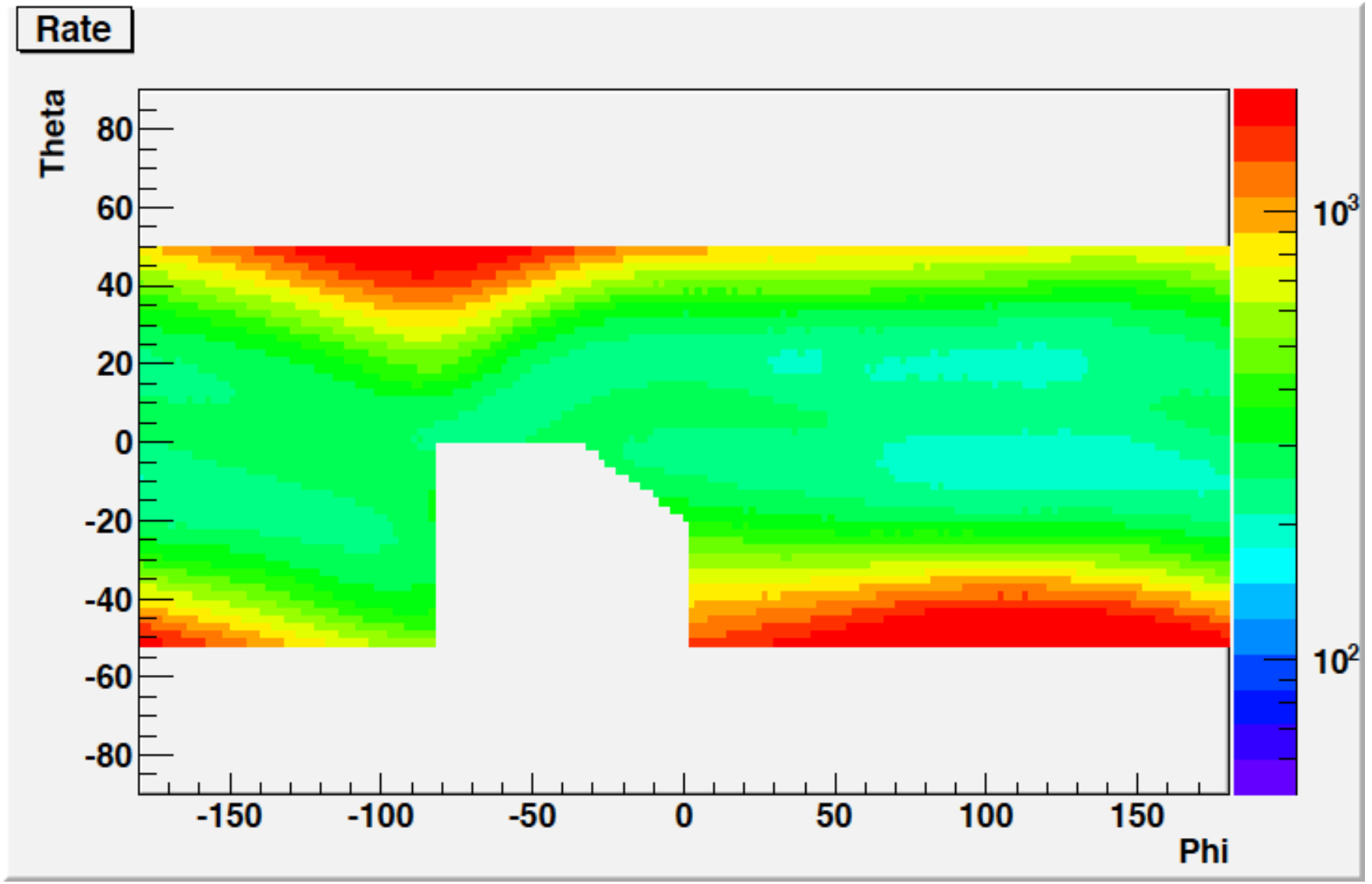






The lower cut at 200 μs (artificial dead time) is clearly visible in all bins.

Results – rate distribution



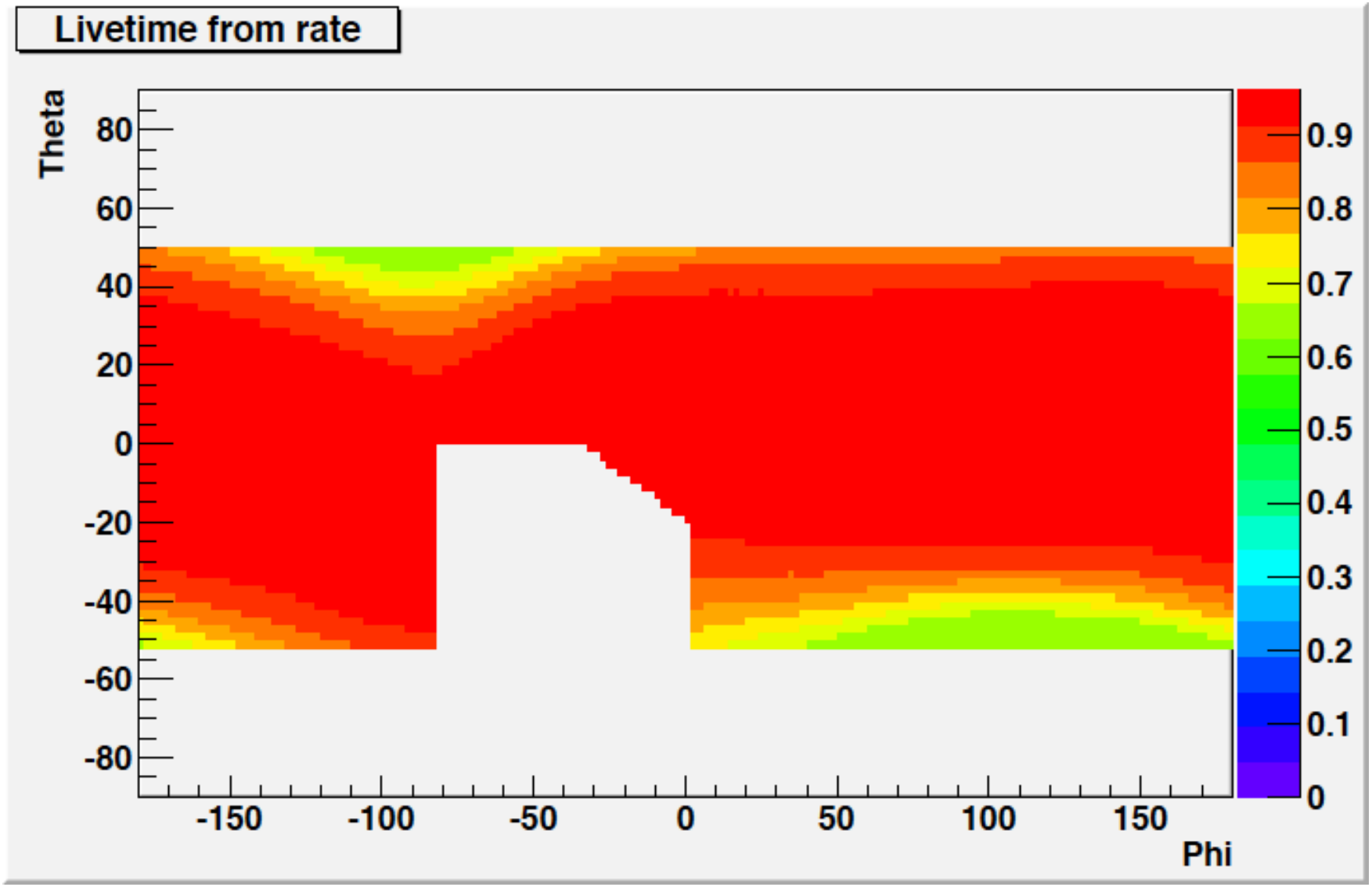
From rate to livetime

The artificial dead time, 200 μs, corresponds to a maximum possible rate of 5000 Hz.

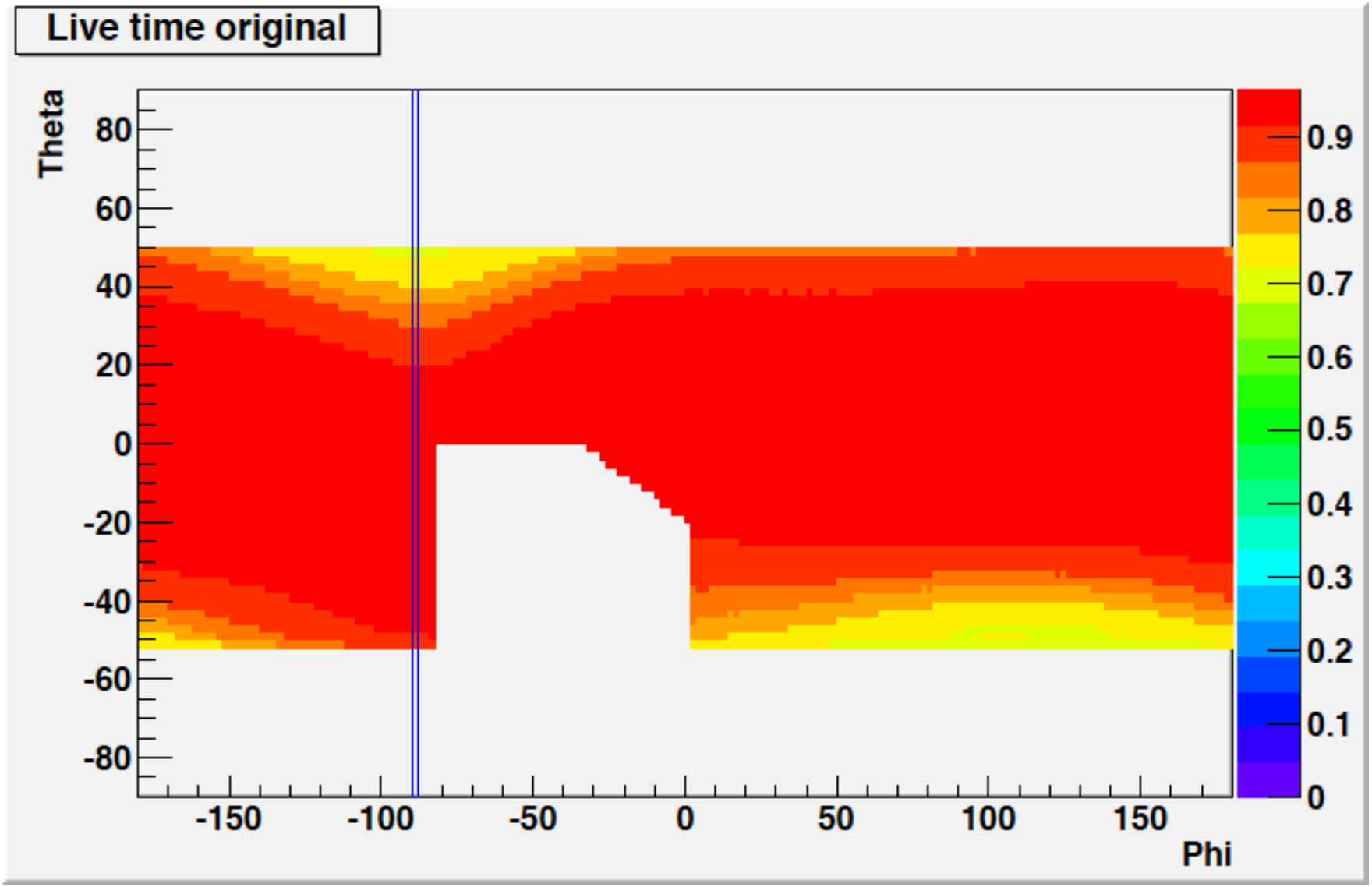
The livetime derived from rate is therefore:

$$\text{livetime} = 1 - \frac{\text{rate(Hz)}}{5000}$$

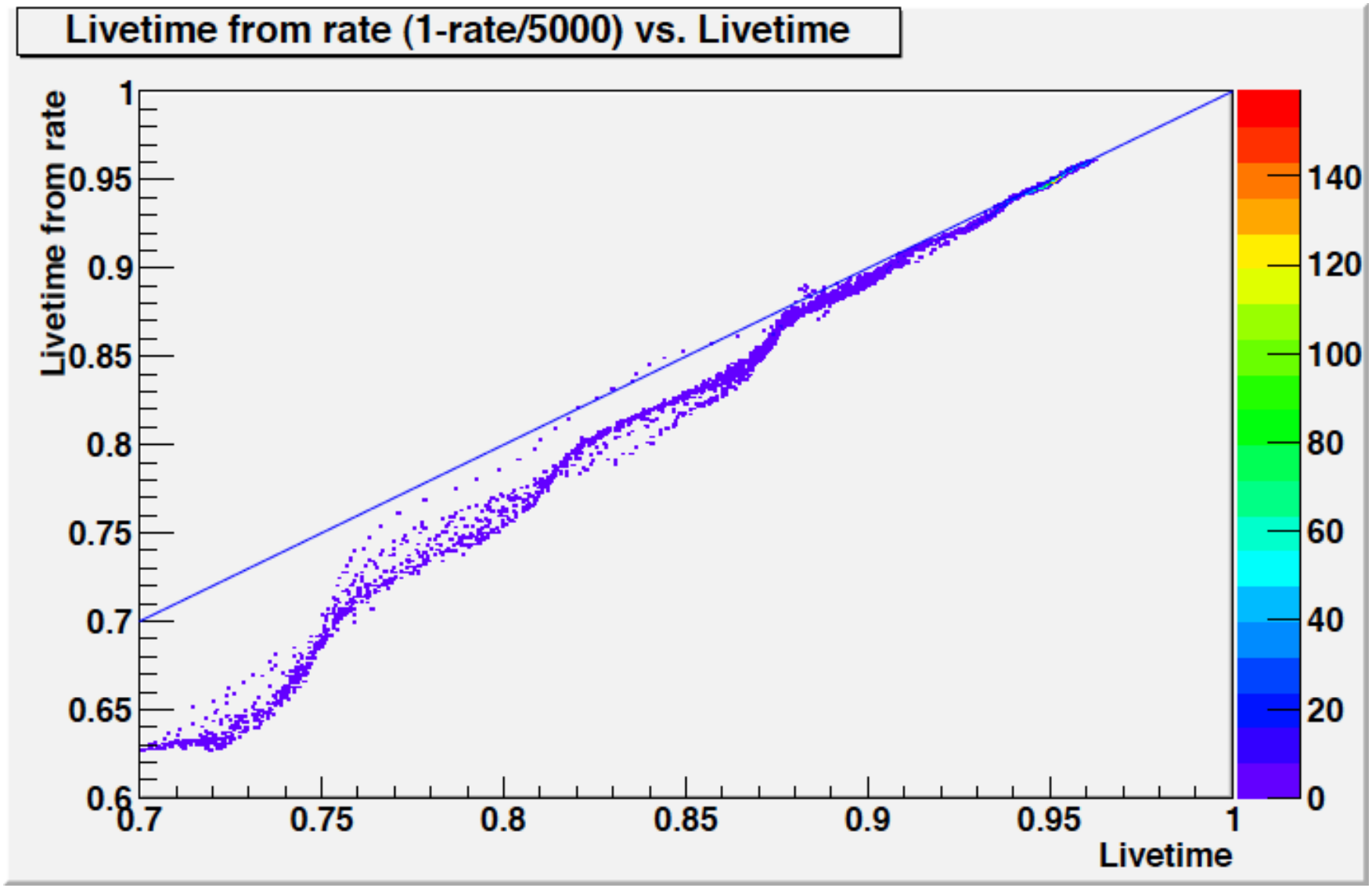
Results – livetime from rate



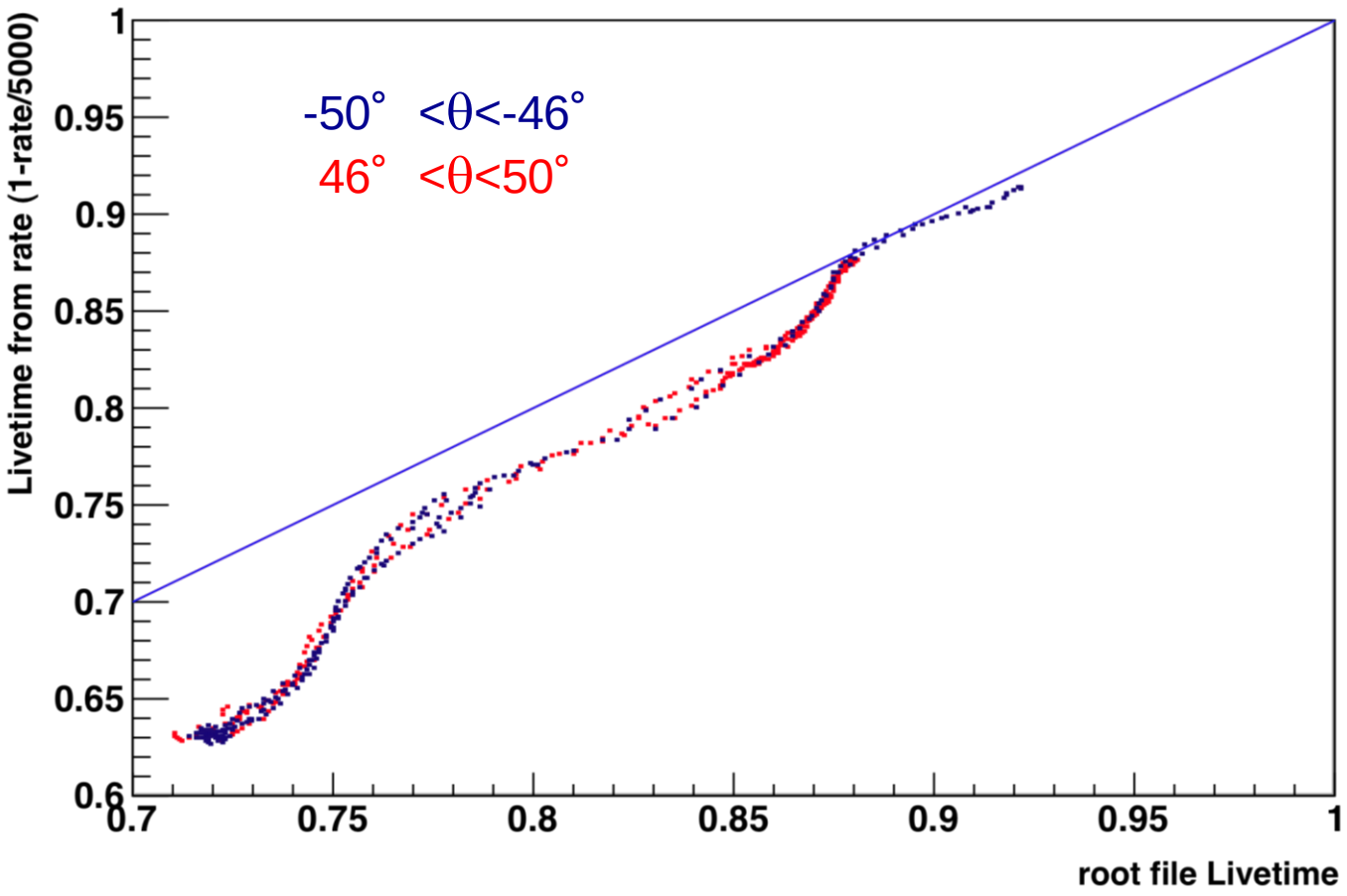
Results – root file livetime distribution



Results – root file livetime vs. livetime from rate



Results – root file livetime vs. livetime from rate (θ slices)



No differences seen between the two theta slices.
Near to the magnetic poles, the livetime from root file seems to be overestimated by about 10%.

Conclusion

I need help to understand these results.